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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/512,134	10/13/2005	Uwe Guntow	62163(45107)	9190
21874 7590 09/19/2008 EDWARDS ANGELL PALMER & DODGE LLP P.O. BOX 55874 BOSTON, MA 02205				
EXAMINER				
LAIOS, MARIA J				
ART UNIT		PAPER NUMBER		
1795				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

## Application No.

10/512,134

## Applicant(s)

GUNTOW ET AL.

## Examiner

MARIA J. LAIOS

## Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 12 August 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5 and 7-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5 and 7-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-8508)  
Paper No(s)/Mail Date 20080327
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12 August 2008 has been entered.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Vikar et al. (US 5,543,239). With regard to claims 1 and 2, Ivers-Tiffée et al. discloses a high temperature solid electrolyte fuel cell comprising an electrolyte layer between two electrode layers (Figure 12), the electrolyte particles of scandium or yttrium doped zirconium (Table 2, page 1807) on an electrolyte substrate and depositing a nano-porous electrode thin layer by MOD process (page 1809, col. 2 lines 20-25). Ivers-Tiffée et al. fails to disclose an electrolyte boundary layer on the structured electrolyte layer having a thickness of 100 -

500 nm. Vikar et al, discloses a solid oxide electrode design with an electrolyte layer comprising yttria stabilized zirconium (dense electrolyte layer-col. 2 lines 36-40) and a porous electrolyte layer (also yttria stabilized zirconium –col. 5 lines 40-45) with a thickness of 1-2000 micron (100-20000 nm- col. 3-lines 17-18). Vikar et al. teaches that this minimizes the total electrode losses due to charge transfer at the three phase boundary (col. 2 lines 10-14). By including this porous layer the solid oxide fuel cell can be run at a lower temperature which in turn means lower cost of material and fewer problems related to oxidation and corrosion (col. 1 lines 28-33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include the porous electrolyte layer (electrolyte boundary layer) of Vikar et al. to the electrode of Ivers-Tiffée et al because it minimizes the total electrode losses due to charge transfer at the three phase boundary and costs due to a lower temperature of operating the fuel cell.

Claims 1-2, 4-9 and 11 are considered product by process claims. The claims refer to a high-temperature solid electrolyte fuel cell. Therefore the fuel cell only requires an electrolyte layer, an electrolyte boundary layer, and two electrodes. The electrolyte layer is yttrium or scandium doped zirconium dioxide.

The product-by-process limitations of claims are not given patentable weight since the courts have held that patentability is based on a product itself, even if the prior art product is made by a different process (In re Thorpe, 227 USPQ 964, 1985). Moreover, a product-by-process limitation is held to be obvious if the product is similar to a prior art product (In re Brown, 173 USPQ 685, and In re Fessman, 180 USPQ 324). Claim 1-2,

4-9 and 11 as written does not distinguish the product of the instant application from the product of the prior art.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Vikar et al. (US 5,543,239) as applied above to claim 1, and further in view of Herbstritt et al. (Cathode Performance: Influence of MOD-Intermediate Layer and Electrolyte Surface Enlargement, *Proceedings of the Fourth European Solid Oxide Fuel Cell Conference*, 10<sup>th</sup> – 14<sup>th</sup> July 2000, Lucerne, Switzerland, 2000, pp. 697-706).

Ivers-Tiffée modified by Vikar et al disclose the electrolyte particles of Sc-doped ZrO<sub>2</sub> and Gd doped CeO<sub>2</sub> and YSZ (Table 2, page 1807) on an electrolyte substrate and depositing a nano-porous electrode thin layer by MOD process (page 1809, col. 2 lines 20-25) but fails to disclose screen printing the electrolyte particles and the screen printing paste has a solid content of 10-30 weight percent.

Herbstritt et al. discloses that the 8YSZ particle content in the screen-printing paste was adjusted to get an effective electrolyte surface enlargement of 25 percent (Page 699). However, Herbstritt et al does not disclose that screen-printing paste has a solid content of 10-30 weight percent. Herbstritt et al. is clearly teaching that the content of electrolyte particle (which is a solid) is a results effective variable that that controls the effective electrolyte surface enlargement.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have 10-30 weight percent of scandium stabilized zirconium or yttrium stabilized zirconium particle in the screen printing paste because it has been held by the courts that optimization of a results effective variable is not novel. *In re Boesch*, 617 F2d 272, 205 USPQ 215 (CCPA 1980).

5. Claims 5, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Vikar et al. (US 5,543,239) as applied above to claim 1, and further in view of Herbstritt et al. (Increased Cathode Performance using a Structured Electrolyte Surface, *Electrochemical Society Proceedings*, Volume: 99-19, 1999, pp. 972-980, hereinafter Herbstritt 2).

With respect to claim 5, Ivers-Tiffée modified by Vikar et al disclose the fuel cell as is discussed above and incorporated herein but fail to disclose the particle size of the electrolytic material as 5-20 microns. Herbstritt discloses an electrolytic material (8YSZ) having particle of ~ 17 microns (abstract). Herbstritt teaches increasing the electrolyte surface area leads to a decrease in the cathode resistance (page 697, First paragraph of the introduction) which leads to an increase performance of the fuel cell.

It would have been obvious to one of ordinary skill in the art at time of the invention to have the electrolyte of Ivers-Tiffée have a particle size of ~ 17 microns of Herbstritt because this leads to a decrease in the cathode resistance.

With respect to claim 8, Ivers-Tiffée modified by Vikar et al disclose the electrode as discussed above and incorporated herein. Ivers-Tiffée discloses LSM as the electrode but fails to disclose the material as ULSM. Herbstritt discloses the electrode material for a SOFC as ULSM and LSM (Abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the LSM of Ivers –Tiffée with the ULSM of Herbstritt because both are known to be effective active materials for SOFCs and the references teaches that they are art recognized equivalents for the same purpose. See MPEP 2144.06.

With respect to claim 11, Herbstritt further discloses the ULSM coating solution having a content of 11-12 percent which will lead to high electrical conductivity (page 699 lines 19-25) when applying the MOD method.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have the coating content of the ULSM to be 11-12 percent because Herbstritt teaches that this leads to high electrical conductivity when applied by the MOD method.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Vikar et al. (US 5,543,239)

as applied above to claim 1, and further in view of in view of Chen et al. (US 6,645,656 B1).

Ivers-Tiffée modified by Vikar et al disclose the cathode material as LSM (page 1806 col. 2 last paragraph) but fails to disclose the LSC electrode compound. Chen et al. teaches a solid oxide fuel cell in which a thin film of  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_{3-\delta}$  is applied by MOD on top of an YSZ layer (col. 5 lines 16-23 and col. 2 lines 28-31) and that LSM (ULSM  $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$ ), a widely used cathode material can also be used (col. 6 lines 28-30). It would have been obvious to one of ordinary skill at the time of the invention to replace the LSM of Ivers-Tiffée with the  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_{3-\delta}$  of Chen because LSM and  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_{3-\delta}$  are known to be effective active materials for SOFC and the reference teaches that they are art recognized equivalents for the same purpose. See MPEP 2144.06.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811), Vikar et al. (US 5,543,239) and Chen et al. (US 6,645,656 B1) as applied to claim 7 above, and further in view of Herbstritt et al. (Increased Cathode Performance using a Structured Electrolyte Surface, *Electrochemical Society Proceedings*, Volume: 99-19, 1999, pp. 972-980, hereinafter Herbstritt 2).

Ivers-Tiffée et al. modified by Vikar et al. and Chen fail to disclose the mass percent in the coating solution.



Herbstritt 2 teaches the concentration of the coating solution as 11 to 12 percent (Page 974 line 9) for coating the material onto the electrolyte thereby producing perovskite structure. This MOD layer exhibit high electrical conductivity (page 974 lines 7-17). It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the concentration of the coating solution of Ivers-Tiffée modified by Vikar et al. and Chen to be between 11-12 percent because Herbstritt 2 teaches that this concentration of the coating solution will eventually lead to an electrode structure having high electrical conductivity.

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Herbstritt et al. (Increased Cathode Performance using a Structured Electrolyte Surface, *Electrochemical Society Proceedings*, Volume: 99-19, 1999, pp. 972-980, hereinafter Herbstritt 2), et al. (US 5,543,239), Vikar et al. (US 5,543,239) and Van Berkel et al. (US 2002/0031694 A1) .

With respect to claim 10, Ivers-Tiffée et al discloses the electrolyte particles of Sc-doped  $\text{ZrO}_2$  and YSZ (Table 2, page 1807) on an electrolyte substrate and depositing a nanoporous electrode thin layer by MOD process (page 1809, col. 2 lines 20-25) but fails to disclose screen printing the electrolyte particles onto an unsintered electrolyte. Herbstritt 2 teaches screen printing the electrolyte onto an unsintered electrolyte substrate and

then sintering the structure increases the contact between the electrolyte particles and the substrate (Page 975 paragraph 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to screen print the electrolyte of Ivers-Tiffée onto an unsintered electrolyte substrate because Herbstritt et al. teaches this increases the contact between the electrolyte particles and the substrate.

Ivers-Tiffée et al. modified by Herbstritt et al. fail to disclose an electrolyte boundary layer on the structured screen printed electrolyte layer obtained where the electrolyte boundary layer is applied by and MOD process and has a thickness of 100-500 nm.

Vikar et al, discloses a solid oxide electrode design with an electrolyte layer comprising yttria stabilized zirconium (dense electrolyte layer—col. 2 lines 36-40) and a porous electrolyte layer (also yttria stabilized zirconium —col. 5 lines 40-45) with a thickness of 1-2000 micron (100-20000 nm- col. 3-lines 17-18). Vikar et al. teaches that this minimizes the total electrode losses due to charge transfer at the three phase boundary (col. 2 lines 10-14). By including this porous layer the solid oxide fuel cells can be run at a lower temperature which in turn means lower cost of material and fewer problems related to oxidation and corrosion (col. 1 lines 28-33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include the porous electrolyte layer (electrolyte boundary layer) of Vikar et al. to the electrode of Ivers-Tiffée et al because it minimizes the total electrode losses due to charge transfer at the three phase boundary and costs due to a lower temperature of operating the fuel cell.

Vikar et al. discloses the porous electrolyte layer but fails to state the method of applying this layer. Van Berkel et al. teach the layer thickness of a solid electrolyte can be reduced and the conductivity can be enhanced by MOD spin casting (Paragraph 87). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the layer of Vikar deposited on the sintered electrolyte of Ivers-Tiffée et al. by MOD spin casting because this reduces the conductivity.

### ***Response to Arguments***

9. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection as necessitated by amendment. Furthermore no evidence has been provided that claims 1-2, 4-9 and 11 are distinguished over prior art, therefore these claims are still considered as product by process claims.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARIA J. LAIOS whose telephone number is (571)272-9808. The examiner can normally be reached on Monday - Thursday 10 am -7 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. L./  
Examiner, Art Unit 1795

/SUSY N TSANG-FOSTER/  
Supervisory Patent Examiner, Art Unit 1795